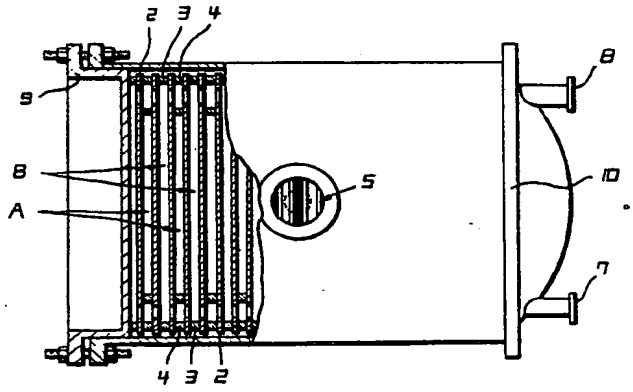
(12) UK Patent Application (19) GB (11) 2 028 995 A

(21) Application No 7835023
(22) Date of filing 30 Aug 1978
(23) Claims filed 30 Aug 1978
(43) Application published 12 Mar 1980
(51) INT CL³ F28F 3/08
(52) Domestic classification F4S 4G 4JY 4U29 4X
(56) Documents cited
GB 1494060
GB 1430491
GB 1405976
GB 1376561
GB 1371277
GB 1302516
GB 1282029
GB 1128181
GB 1023081
GB 976120
GB 421336
GB 391894
GB 319621
(58) Field of search F4S
(71) Applicants
Hisaka Works Limited,
No. 4, 4-chome,
Hiranomachi, Higashi-ku,
Osaka-shi, Osaka-fu,
Japan
(72) Inventor
Hiroyuki Sumitomo
(74) Agents
Reginald W. Barker & Co.

(54) A stacked plate heat exchanger

(57) A stacked plate and shell type heat exchanger wherein a number of circular or semispherical plates 2 are put together to define alternate passages A, B for a heat-supplying fluid and a heat-receiving fluid.

Fig_3



GB 2 028 995 A

Fig_1

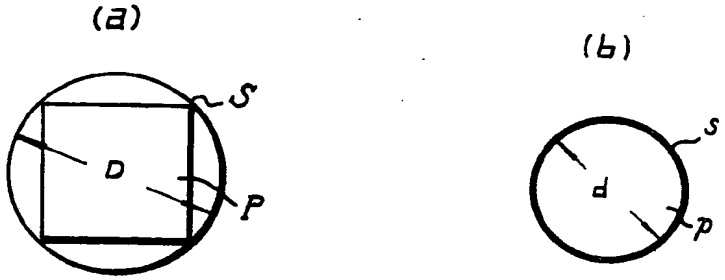


Fig_2

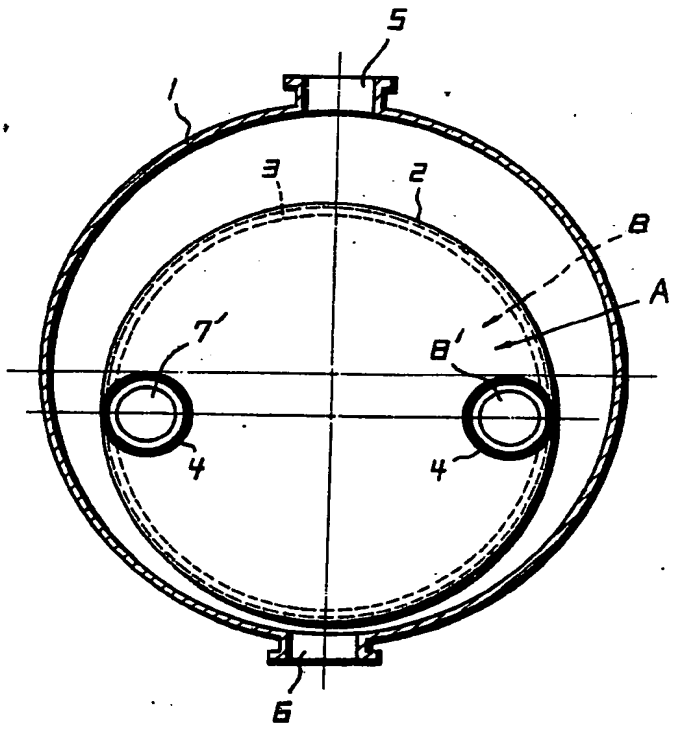


Fig_3

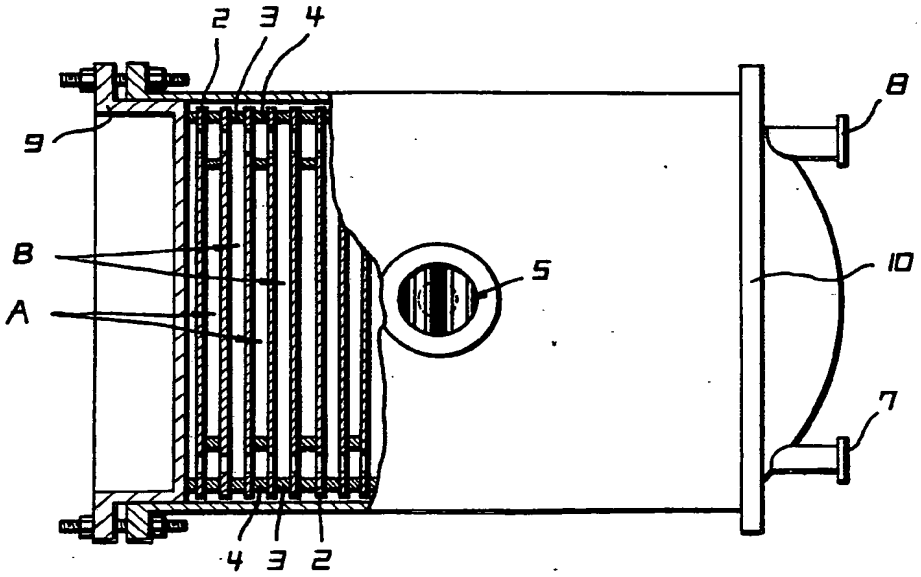


Fig_4

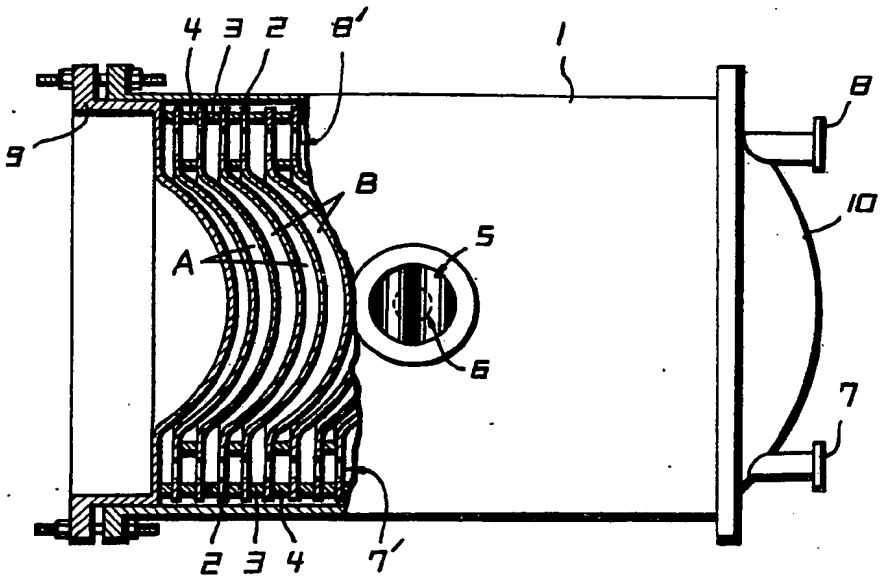


Fig_5

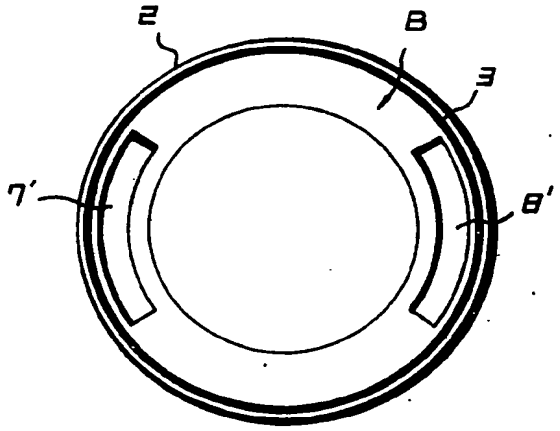


Fig_6

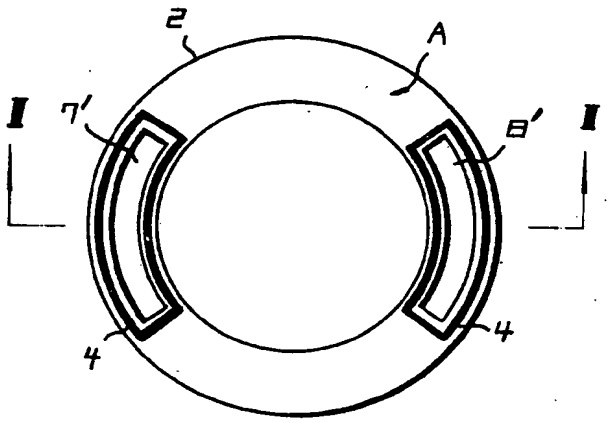
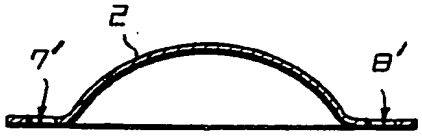


Fig_7



SPECIFICATION

Plate type heat exchanger

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to a plate type heat exchanger and more particularly it relates to a heat exchanger of the plate and shell type in which a number of plates are put together and received in a container or shell to define passages for a heat-transmitting fluid and a heat-transmitted fluid which alternate with each other.

(b) Objects of the Invention

An object of the present invention is to minimize the shell diameter in the plate and shell type heat exchanger.

Another object of the invention is to provide a plate and shell type heat exchanger wherein the strength of the plates is high and the heat transmitting performance is superior.

(c) Description of the Prior Art

In such plate and shell type heat exchanger, the plate thickness of the container, i.e., shell is determined by the internal pressure and diameter of the shell. In the prior art plate and shell type heat exchanger, however, since rectangular or square plates are used, the diameter of the shell has been larger than is necessary. More particularly, as is evident from Figs. 1a and 1b, in order to accommodate a square plate P having a heat transmitting area of, e.g., 225m^2, it is necessary that the inner diameter *D* of the shell 3 be 21.2m, whereas in the case of a circular plate P, the inner diameter *d* of the shell S may be reduced to a minimum of 16.9m. In the prior art, since the shell diameter is larger than is necessary as described above, the thickness of the fixed frame and of the shell is very large, the cost of the heat exchanger is high and the heat exchanger size for the same heat transmitting area is large.

ABSTRACT OF THE INVENTION

The invention relates to a plate type heat exchanger in which a number of circular or quasi-circular plates or circular and semispherical or quasi-circular and quasi-semicircular plates are put together and received in a container or a shell so that the clearances between the plates define passages for a heat-transmitting fluid and a heat-transmitted fluid which alternate with each other.

FEATURES OF THE INVENTION

A feature of the invention is that in the plate and shell type heat exchanger, circular or quasi-circular plates are used instead of the conventional rectangular or square plates.

Another feature of the invention is that in the plate and shell type heat exchanger, circular and semicircular or quasi-circular and quasi-semicircular plates are used instead of the conventional rectangular or square plates.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1a and 1b are schematic views showing the relation between the plate shape and shell diameter in the plate and shell type heat exchanger;

Figs. 2 and 3 show an embodiment of a plate type heat exchanger according to the present invention, in which Fig. 2 is a sectional view taken along a line passing through a steam passage and Fig. 3 is a plan view of a shell with a portion thereof broken away; and

Figs. 4 through 7 show another embodiment of the invention, in which Fig. 4 is a a plan view of a plate and shell type heat exchanger with a portion thereof broken away, Fig. 5 is a front view of one side of a plate facing on a cooling water passage, Fig. 6 is a front view of the other side of the plate facing on a steam passage, and Fig. 7 is a sectional view taken along the line I—I of Fig. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figs. 2 and 3, the numeral 1 designates a shell and 2 designates a number of circular plates put together and received in the shell 1, said plates being clamped between a movable frame 9 and a fixed frame 10. These plates 2 are put together with gaskets so that the clearances between the plates define passages for a heat-transmitting fluid and a heat-transmitted fluid which alternate with each other. Thus, to take, as an example, a case of condensation, the numeral 5 designates a steam supply port; 6 designates a steam discharge port; 7 designates a cooling water supply port; and 8 designates a cooling water discharge port. In the plate clearances for cooling water flow, gaskets 3 are installed on the plates 2 around the outer peripheries thereof to define the peripheral edges of cooling-water passages B. The cooling water passages B communicate with cooling water inlet and outlet ports 7′ and 8′. The plate clearances for steam flow, i.e., steam passages A are isolated from the cooling water inlet and outlet ports 7′ and 8′ by gaskets 4 installed around the latter but are open to the interior of the shell 1. The plates 2 are eccentric with respect to the shell 1 and displaced in the direction of the steam inlet and outlet ports 5 and 6.

Therefore, if steam is supplied from the steam supply port 5 while cooling water is supplied from the cooling-water supply port 7, the cooling water will flow from the cooling water inlet ports 7′ into the cooling water passages B and then out into the discharge port 8 through the cooling water outlet ports 8′. When the steam distributively flows into the individual steam passages A, it is cooled through the plates 2 by said cooling water flowing through adjacent cooling water passages B and thereby condenses, the condensate flowing down along the surfaces of the plates 2 until it flows out through the discharge port 6.

In addition, the cooling water inlet and outlet ports 7 and 8 are shown circular in the illustrated embodiment, but they are not limited thereto.

Figs. 4 through 7 show a modification of the embodiment described above, wherein the circular

plates 2 of the plate type heat exchanger shown in Figs. 2 and 3 are replaced by semispherical plates 2′, the rest of the arrangement being the same as in Fig. 3, like parts being designated by like reference characters. The plates 2′ begin semispherical increases the strength, enabling the plate thickness to be reduced. Consequently, the plate thickness resistance in the heat transmitting material is reduced and improves the heat transmitting performance. Further, the use of materials of low heat transfer rate, e.g., plastics, is made possible, thus contributing to the reduction of cost.

The shape of the cooling water inlet and outlet ports 7′ and 8′ is not limited to a sector shown in Figs. 5 and 6. However, such sector, coupled with the semispherical shape of the plates 2′, makes the distance between the cooling water inlet and outlet ports 7′ and 8′ equal at all positions, so that it may be said to be a satisfactory shape and arrangement for preventing the deflected flow or short pass of the cooling water.

Further, the cooling water inlet and outlet ports 7′ and 8′ are horizontally arranged in the first and second embodiments described above, but they may be arranged in the same direction as the steam supply and discharge ports 5 and 6 to provide counter flow or parallel flow.

The plates 2 need not be circular but may be quasi-circular, and the plates 2′ need not be semispherical but may be quasi-semispherical.

The plates may be made of plastic, in which case end material can be reused, effecting economy.

Whiles there have been described herein what are at present considered preferred embodiments of the several features of the invention, it will be obvious to those skilled in the art that modifications and changes may be made without departing from the essence of the invention.

It is therefore to be understood that the exemplary embodiments thereof are illustrative and not restrictive of the invention, the scope of which is defined in the appended claims and that all modifications that come within the meaning and range of equivalency of the claims are intended to be included therein.

CLAIMS

1. A plate type heat exchanger having a number of plates put together so that the clearances between the plates define passages for a heat-transmitting fluid and a heat-transmitted fluid which alternate with each other, said heat exchanger being characterized in that the plates are circular or quasi-circular.

2. A plate type heat exchanger as set forth in Claim 1, characterized in that the plates are semispherical or quasi-semispherical.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.